KONICA MINOLTA

2D Color Analyzer CA-2000

CA-2000S (with standard lens)
CA-2000W (with wide lens)
CA-2000T (with telephoto lens)
CA-2000SW (with standard & wide lenses)
CA-2000ST (with standard & telephoto lenses)
CA-2000WT (with wide & telephoto lenses)
CA-2000A (with all lenses)

Easy evaluation of displays using high-resolution data !!

2D Color Analyzer for quick, accurate measurement of luminance and chromaticity distribution

Giving Shape to Ideas

2D Color Analyzer CA-2000 for quick, accurate measu

The 2D Color Analyzer CA-2000 incorporates XYZ filters and a high-resolution CCD to offer sensitivity closely that of the human eye. This allows accurate 2D measurement of the luminance and chromaticity distribution projectors, and backlights with high-resolution data. User-friendly, included software enables PC control of the for quick and efficient measurement, data analysis, and evaluation with easy operation. This combination is a tool for development evaluation or inspection.

Simple measurement, analysis, and evaluation using CA-S20w (included as standard accessory) !

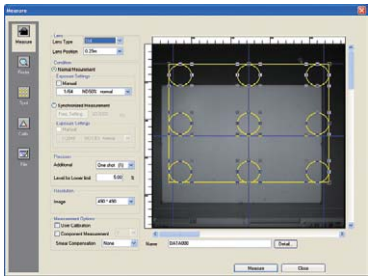
FPD measurement example

Step 1

Setting and measurement

Simple setting of measurement area

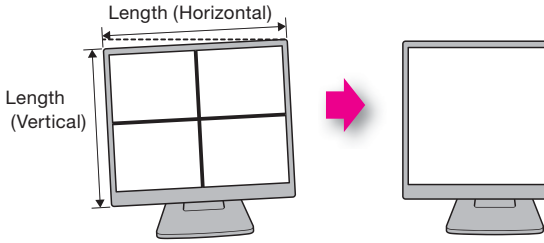
Measurement area can be easily adjusted while watching the viewfinder image in the screen, without moving the CA-2000.



* Image shows measurement screen and finder view.

Automatic correction of measurement su

Automatically corrects for slight tilting or positioning measurement subject display at the time of measuren

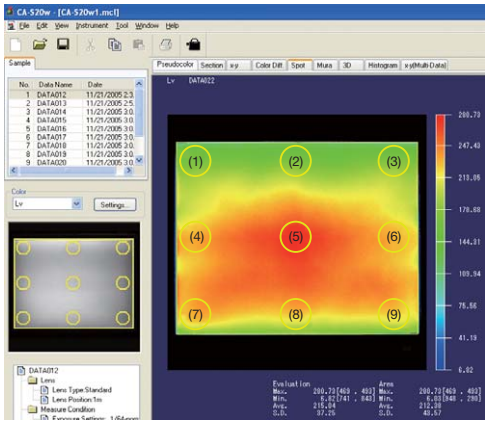


Step 2

Data analysis

Screens suitable for the application can be created and saved.

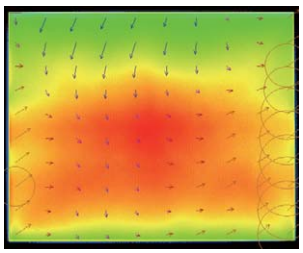
A basic screen for data analysis is provided initially, and can be used immediately after purchase. The screen layo changed as necessary with various graphs and data displays, and user-defined layouts can also be saved as templat



* Image shows screen example of 9-spot measurement.

Pseudocolor display

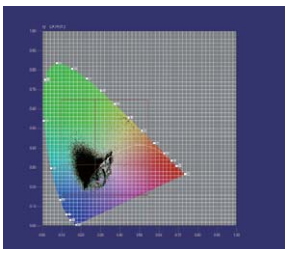
For observation of luminance and chromaticity distribution.



Color difference display

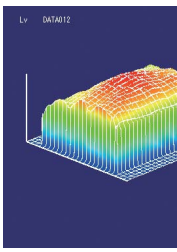
Color differences are shown as vectors, and differences exceeding set limits are emphasized with circles.

* Image shows screen example of 100-spot color difference measurement.



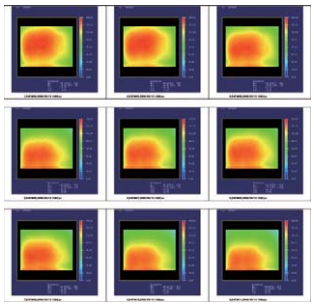
Chromaticity diagram display

Clearly shows the variations in chromaticity.



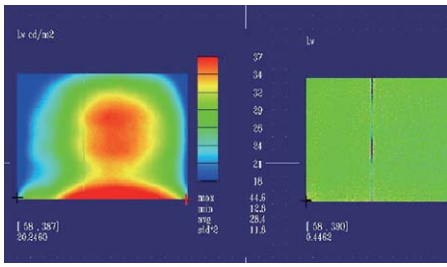
3D graph display

Displays data in a 3D s understanding of overa



Multi-screen display

Thumbnails of various graphs can be displayed and compared.



* The screen shows examples of the pseudocolor display (left) and enha display (right) when a display showing streaks of nonuniformity is measured

Enhanced nonuniformity display

Spots or streaks of nonuniformity can be enhanc identification of defects.

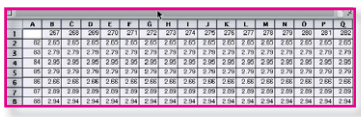
Step 3

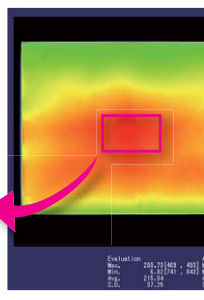
Evaluation and reporting

Data transfer to Excel and word

The data in a specified range can be transferred to Microsoft Excel®and Word®. Copying and pasting graphs facilitates preparation of reports.

* Excel® , Word® are trademarks of Microsoft Corporation in the USA and other countries.





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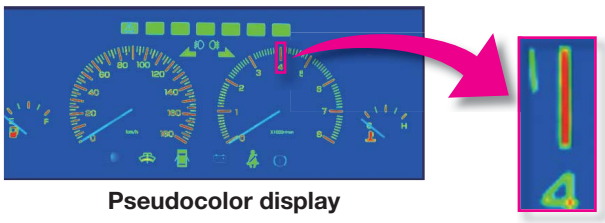
Indicator dial and keypad measurement examples

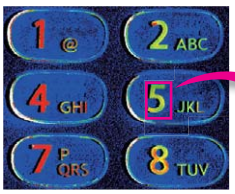
RGB image display



Pseudocolor display

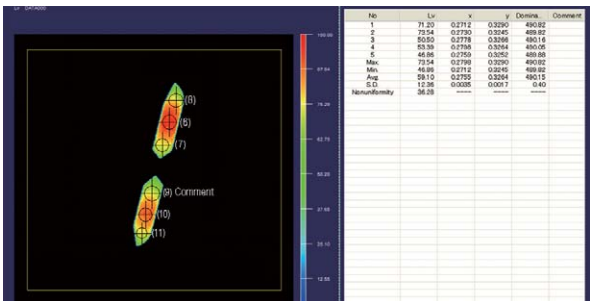
Automatic extraction of measurement spot areas to measure the brightness and color distribution of small letters and indicators.

RGB image display



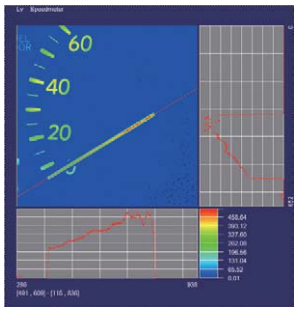
Pseudocolor display

- When the shapes of the light-emitting areas of the measurement subject are complicated, this function extracts and measures only the light-emitting areas.
- The threshold value for extraction can be set automatically or the luminance threshold value can be set to the desired value.



Spot display

- Statistics for areas within the spots are displayed in a list, and spots can be given numbers and labels. ⌖ mark makes verifying measurement position easy.
- List display of statistical values for spot areas
- Number and comment can be input for each spot area.
- + mark make checking measurement position easy.



Cross-section display

The horizontal and vertical cross-sections at the cursor position can be displayed.

Histogram display

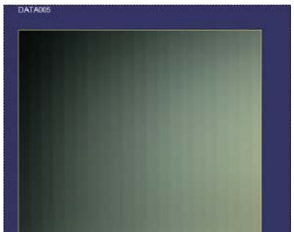
Displays a histogram (frequency distribution) to make it easier to observe variations in luminance and chromaticity.

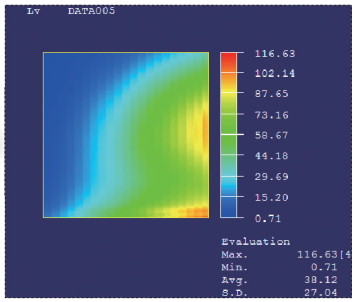
Even more convenient!

Multiple exposure function

By combining different optimum exposure times, subjects with luminance levels from low to high in different areas can be measured.

Measurements requiring a wide dynamic range, such as a gray scale, can be measured.





User calibration for each color region

When simultaneously measuring LEDs with different colors, for example, by calibrating for each color, high-accuracy measurements can be performed.

# of luminance and chromaticity distribution !

Sensor with XYZ filters offers high correlation to the sensitivity of the human eye

The instrument features a sensor with XYZ filters to offer spectral response that correlates closely with the CIE1931 color-matching functions, instead of the RGB color-separation filters used in digital cameras or color CCD cameras. This ensures luminance/chromaticity measurements that correlate well with evaluation by human eyes.

Interchangeable lenses for measurements of various objects

The instrument can be used for various applications by selecting the optimum lens from standard, wide-angle and telephoto lenses (plus two types of macro rings for telephoto lens) according to the size of the object.

Individual lens calibration using multiple focal points

Each lens is individually calibrated for the sensitivity fluctuations caused by sensors, optical filters and the lens itself, using multiple focal points. Accurate measurement of luminance and chromaticity distribution can be started immediately after purchase.

High-resolution one-million-pixel CCD

Enables accurate measurements of even small areas.

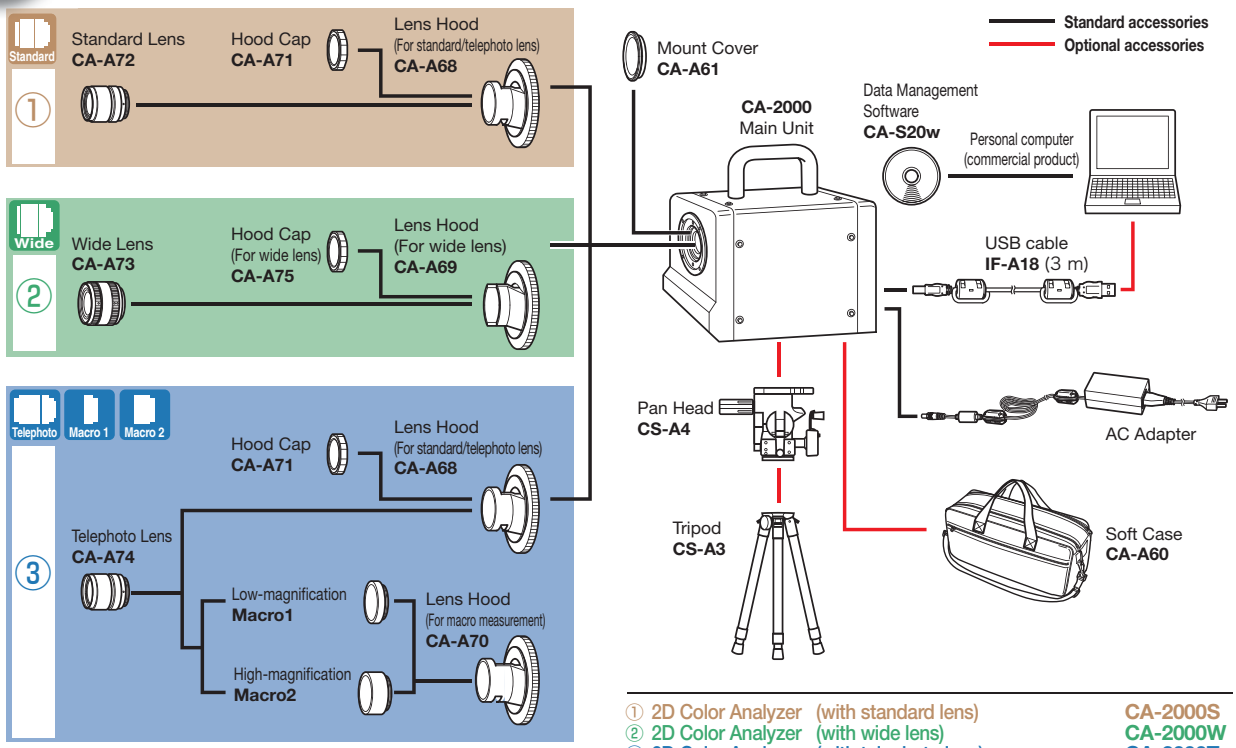
Easy operation with included software

Other functions

- Synchronized measurement is available by numerical input of the sync frequency for the subject display device. (Settable range: 4 to 2,000 Hz)
- Integration of a maximum of 256 measurements ensures accurate measurements of even low luminance.
- User calibration for luminance and chromaticity.
- Backlight cancel function compensates for the effect of backlight variations when performing evaluation.

System

System Configuration



Components other than those shown in the areas shaded ■ ■ ■ are common for all packages.

* Each lens comes with a lens cap, mount cap, and calibration data DVD.

① 2D Color Analyzer (with standard lens)	CA-2000S
② 2D Color Analyzer (with wide lens)	CA-2000W
③ 2D Color Analyzer (with telephoto lens)	CA-2000T
Combination of ① and ② (with standard and wide lenses)	CA-2000SW
Combination of ① and ③ (with standard and telephoto lenses)	CA-2000ST
Combination of ② and ③ (with wide and telephoto lenses)	CA-2000WT
Combination of ①, ② and ③ (with all lenses)	CA-2000A

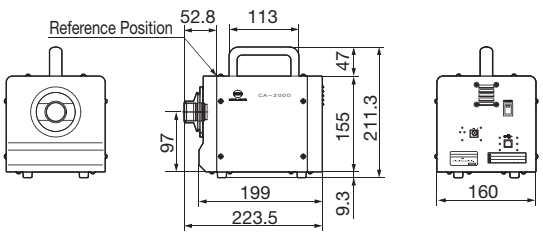
Size

Measurable object size with typical measurement distances (Width/height of measurement square)

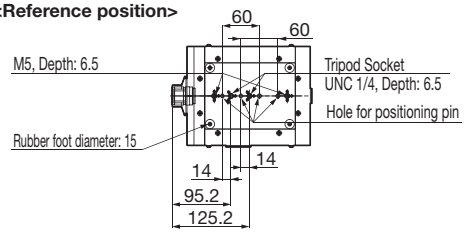
Distance (mm)	Standard lens			Wide lens			Telephoto lens			Low magnification macro ring			High magnification macro ring		
	Measurement size (mm)	Measurable display size (inches)		Measurement size (mm)	Measurable display size (inches)		Measurement size (mm)	Measurable display size (inches)		Measurement size (mm)	Measurable display size (inches)		Measurement size (mm)	Measurable display size (inches)	
		16 : 9	4 : 3		16 : 9	4 : 3		16 : 9	4 : 3		16 : 9	4 : 3		16 : 9	4 : 3
200				145	6.5	7.1									
250	98	4.4	4.8	190	8.6	9.3									
300	121	5.5	6	235	11	12							27	1.2	1.3
500	212	9.6	10.4	416	19	20				57	2.5	2.8			
900	393	18	19	779	35	38	116	5.2	5.7						
1000	439	20	22	869	39	43	130	5.9	6.4						
1500	665	30	33	1323	60	65	203	9.2	10						
2000	892	40	44	1776	80	87	275	12	14						
3000	1345	61	66	2682	121	132	420	19	21						
4000	1798	81	89	3589	162	177	566	26	28						
5000	2252	102	111	4495	203	221	711	32	35						

■ Dimensions (Unit: mm)

*When standard lens and lens hood are attached



<Reference position>



Main Specifications CA-2000

Model		CA-2000S	CA-2000W	CA-2000T		
Light receptor		CCD image sensor (monochrome); 2/3-inch; Effective number of pixels: 1,000 x 1,000 pixels; Equipped with XYZ filter (closely matches CIE 1931 color-matching function) and ND filter				
Lens		Interchangeable Standard, wide, and telephoto lenses; low-magnification and high-magnification macro rings (for use with telephoto lens)				
Measurement points (Resolution)		980 x 980 (Available to select 490 x 490 or 196 x 196 by using Data Management Software CA-S20w)				
Color indication modes		XYZ, L_Yxy, $L_Yu'v'$, $T\Delta uv$, Dominant wavelength, Excitation purity, L_Y contrast				
Display modes		Pseudocolor, RGB image, Chromaticity diagram, Spot, 3D graph, Histgram, Nonuniformity enhancement, Cross section, Color difference, Multi-screen				
Measurement sizes (length per side of square) (*1)		Standard lens	Wide lens	Telephoto lens	With low-magnification macro ring	With high-magnification macro ring
		Approx. 98 ㎜ or more (depending on the distance)	Approx. 145 ㎜ or more (depending on the distance)	Approx. 115 ㎜ or more (depending on the distance)	Approx. 57㎜ (Fixed)	Approx. 27㎜ (Fixed)
Measurable size for typical measurement distances (size/distance)		98 ㎜ / 250 ㎜ ㎜ Approx.	145 ㎜ / 200 ㎜ Approx.	115 ㎜ / 900 ㎜ Approx.	57 ㎜ / 500 ㎜ Approx. (Fixed)	27 ㎜ / 300 ㎜ Approx. (Fixed)
		210 ㎜ / 500 ㎜ Approx.	410 ㎜ / 500 ㎜ Approx.	275 ㎜ / 2,000 ㎜ Approx.		
		440 ㎜ / 1,000 ㎜ Approx.	850 ㎜ / 1,000 ㎜ Approx.	420 ㎜ / 3,000 ㎜ Approx.		
		890 ㎜ / 2,000 ㎜ Approx.	1,770 ㎜/ 2,000 ㎜ Approx.			
Measurement luminance range (including ND filter use)		0.1 - 100,000 cd/m²	0.1 - 100,000 cd/m²	0.5 - 100,000 cd/m²	0.5 - 100,000 cd/m²	1 - 100,000 cd/m²
Measurement time (*2)		Single : Approx. 5 sec. or more; 4-time integration: Approx. 6 sec. or more; 16-time integration: Approx. 10 sec. or more; 64-time integration : Approx. 28 sec. or more; 256-time integration : Approx. 98 sec. or more				
Accuracy (*3)	Luminance	±3 %	±3 %	±3 %	±3 %	±3 %
	Chromaticity	±0.005	±0.005	±0.005	±0.005	±0.005
		Temperature/humidity drift (within the operating temperature/humidity range) Luminance: ±2% of change compared to reference temperature and relative humidity of 23°C and 40% Chromaticity: ±0.004 of change compared to reference temperature and relative humidity of 23°C and 40%				
Repeatability (*4)	Luminance	0.5 %	0.5 %	0.5 %	0.5 %	0.5 %
	Chromaticity	0.001	0.001	0.001	0.001	0.001
Inter-point error (*5)	Luminance (*6)	±2 %	±2 %	±2 %	±2 %	±2 %
	Chromaticity (*6)	±0.002	±0.002	±0.002	±0.002	±0.002
	Luminance (*7)	±3 %	±3 %	±3 %	±3 %	±3 %
	Chromaticity (*7)	±0.003	±0.003	±0.003	±0.003	±0.003
Other functions		Interval measurement, Measurement sync (Synchronization frequency selectable), Integration function, Enhanced nonuniformity display, Conversion of enhanced nonuniformity image into numerical values (statistical values, etc.), Pixel binning function				
Interface		USB 2.0 or higher				
Operating temperature and humidity range (*8)		10-30°C, Relative humidity 70% or less/No condensation				
Storage temperature and humidity range (*8)		0-30°C, Relative humidity 70% or less/No condensation, 30-35°C, Relative humidity 55% or less/No condensation				
Size	Body only	160 (W) × 164 (H) × 199 (D) ㎜ (Height including handle: 211 ㎜)				
	When lens and lens hood are attached	224 (D) ㎜	219 (D) ㎜	224 (D) ㎜	230 (D) ㎜	237 (D) ㎜
Weight		3.5 kg approx. (when standard lens and lens hood are attached)				
Power source		AC adapter 100-240 V ∿ , 1.2 A, 50-60 Hz				
Standard accessories	Lens Hood	CA-A68	CA-A69	CA-A68	CA-A70	
	Hood Cap	CA-A71	CA-A75	CA-A71		
	Calibration data DVD	Included with each lens.				
	Other	Mount Cover CA-A61, AC Adapter, USB Cable IF-A18, Data Management Software CA-S20w				
Optional accessories		Soft Case CA-A60, Tripod CS-A3, Pan Head CS-A4, Calibration certificate				

*1: **Error in angle of view:** 7%

*2: Measurement time differs depending on brightness of measurement object, PC performance, and data processing contents.
The specifications above were obtained under Konica Minolta's measurement conditions shown below:
PC's CPU : Pentium 4, 2.8GHz
Data processing : Pseudocolor display of luminance data
Resolution : 490 x 490
Shutter speed : **Y measurement :** 1/64 sec., **XZ measurement :** 1/32 sec.
Measurement subject brightness: Standard/wide lens: Approx. 80 cd/m², **Telephoto lens:** Approx. 300 cd/m²
Low-magnification macro ring and telephoto lens: Approx. 400 cd/m²,
High-magnification macro ring and telephoto lens: Approx. 600 cd/m²
* The measurement time becomes longer when the object is dark. The longest measurement time is approx. 10 seconds with 1-time integration, approx. 27 seconds with 4-time integration, approx. 95 seconds with 16-time integration, approx. 6 minutes and 8 seconds with 64-time integration and approx. 24 minutes and 19 seconds with 256-time integration

*3: The specifications above were obtained under Konica Minolta's measurement conditions shown below:
Measurement subject brightness: Standard/wide lens: Approx. 35 cd/m², **Telephoto lens:** Approx. 140 cd/ m²
Low-magnification macro ring and telephoto lens: Approx. 250 cd/m²,
High-magnification macro ring and telephoto lens: Approx. 250 cd/m²
Distance: Minimum distance of each lens, **Evaluation:** Based on the average obtained within 10% range at the center of the screen, **Temperature:** 23°C±2°C, **Relative humidity:** 40%±10%, **Measuring light:** White, reference light source, **Integration:** 64 times (Normal mode)

*4: The specifications above were obtained under Konica Minolta's measurement conditions shown below:
Resolution: 196 x 196, **Shutter speed: Y measurement:** 1/64 sec., **XZ measurement:** 1/32 sec. **Gain:** Normal (x1), **Light intensity level:** Midpoint of appropriate light intensity range, **Evaluation:** Based on the maximum repeatability (2 σ) of all pixels, **Temperature:** 23°C±2°C, **Relative humidity:** 40%±10%, **Measurement subject:** White, reference light source, **Integration:** 64 times (Normal mode)

*5: The specifications above were obtained under Konica Minolta's measurement conditions shown below:
Measurement subject brightness: Standard/wide lens: Approx. 40 cd/m², **Telephoto lens:** Approx. 160 cd/m²
Low-magnification macro ring and telephoto lens: Approx. 200 cd/m²,
High-magnification macro ring and telephoto lens: Approx. 350 cd/m²
Distance: Calibration distance of each lens, **Resolution:** 196 x 196
Evaluation (*6) : Based on the maximum/minimum values obtained in a square at the center of the screen measuring 60% of the height and width of the entire screen
(*7) : Based on the maximum/minimum values obtained in the entire screen
Temperature: 23°C±2°C, **Relative humidity:** 40%±10%, **Measurement subject:** White, reference light source, **Integration:** 64 times (Normal mode)

*8: Even if the instrument is stored within the specified usage (or storage) temperature humidity range, the displayed value may change depending on long-period usage or storage conditions.

SAFETY PRECAUTIONS

For correct use and for your safety, be sure to read the instruction manual before using the instrument.

- Always connect the instrument to the specified power supply voltage. Improper connection may cause a fire or electric shock.

CA-S20w System Requirements

OS	Windows XP Professional 32-bit SP3, 64-bit SP2; Windows Vista Business 32-bit, 64-bit Windows 7 Professional 32-bit, 64-bit (English, Japanese and Korean versions For Windows® XP professional 64-bit, English and Japanese versions only)
CPU	Pentium® 4 2.8 GHz equivalent or higher
Memory	1024 MB or more
Hard Disk	Needs free space of 80 MB at least on system drive (where OS is installed) In addition, each lens needs the following free spaces for installing calibration data. For standard lens: approx. 540 MB For wide lens: approx. 470 MB For telephoto lens: approx. 1.3 GB Also to save measurement data on hard disk, additional free space is required. (approx. 11 GB minimum for 1000 measurement data in resolution of 980 x 980)
Display	Display capable of at least 1280 x 1024 dots / High color, 16-bit (Full color, 32-bit recommended)
Others	Optical drive capable of reading CD-ROM (for installing software) and DVD-ROM (for installing calibration data) necessary. USB port: USB ver. 2.0; Type A connector; For connecting measuring instrument Excel® 2003 (under Windows® XP), Excel® 2007 (under Windows® Vista/Windows® 7), or Excel® 2010 (under Windows® 7) necessary for continuous measurements using automation.

- Windows®, Excel® is a registered trademark or a trademark of Microsoft Corporation in the United States and other countries.
- Pentium® is a registered trademark or a trademark of Intel Corporation in the United States and other countries.

The specifications and drawings given here are subject to change without prior notice.
- If you have any questions about specifications, please contact your Konica Minolta representative.
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Certificate No : LRQ 0960094/A
Registration Date : March 3, 1995

Certificate No : JQA-E-80027
Registration Date : March 12, 1997

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